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UPPER HAKALAU FOREST

HAWAII COUNTY, HAWAII

Environmental Assessment

UPPER HAKALAU

Hawaii County, Hawaii

Environmental Assessment

March 1985

ENVIRONMENTAL ASSESSMENT

PROPOSAL TO ESTABLISH AN
UPPER HAKALAU NATIONAL WILDLIFE REFUGE
HAWAII COUNTY, HAWAII

PREPARED BY

DEPARTMENT OF THE INTERIOR

U.S. FISH AND WILDLIFE SERVICE

HONOLULU, HAWAII

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I. PURPOSE AND NEED FOR ACTION

In recent years, the U.S. Fish and Wildlife Service (USFWS), in cooperation with the State of Hawaii and other entities, has proposed and undertaken a number of actions to ensure the continued existence of endangered Hawaiian forest birds. Included among those actions is the perpetuation of habitats in the Upper Hakalau Forest situated on the island of Hawaii.

As a preferred alternative to effect protection of that ecosystem, the USFWS proposes to establish the Upper Hakalau National Wildlife Refuge within boundaries as identified on map in figure 4.

In developing this proposal a number of alternatives were taken into consideration and are identified in Section II of this assessment.

A. *Purpose of Action*

A major purpose of the Endandgered Species Act of 1973 (ESA) is ". . . to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved". Protection and maintenance of habitats is a crucial element of conserving most fish, wildlife and plants facing extinction. Thus, the USFWS must use its expertise and resources to protect and maintain endangered and threatened species habitat.

On the island of Hawaii, or Big Island, there are 20 species of plants or animals which have been formally listed as threatened or endangered (1 reptile, 13 birds, 1 mammal, and 5 plants). Many more candidate[1] taxa are also found on the Big Island. A large number of

[1]Candidate - A taxon which is a subject of a Notice in the Federal Register and may be considered for a proposal to be listed as threatened or endangered at some future date.

these taxa, both listed and candidates, are found in the mesic and wet forests on the slopes of Mauna Kea and Mauna Loa, the two largest volcanoes on the island. Although much of this forest habitat is in public ownership, some vitally important forest habitat is privately owned. One significant area, essential to the long term stability of three or perhaps four endangered forest bird populations, is a region known as the Upper Hakalau forest. This area contains some of the finest stands of koa (Acacia koa) -ohia (Metrosideros collina) and ohia forests remaining in Hawaii (and the world).

The Upper Hakalau forest region is part of the expansive middle forest zone of the mesic and wet koa-ohia forest on the windward slopes of Mauna Kea (Rock 1913). It is located about 20 km northwest of Hilo at elevations between 1,200 m and 2,200 m (Figure 1). An important feature of the koa-ohia and ohia forests of this region is the substantial populations of native birds found there. In particular, the area supports significant populations of the endangered Akiapolaau [Hemignathus munroi (=wilsoni)], Hawaii Akepa (Loxops coccineus coccineus) and Hawaii Creeper [Oreomystis (=Loxops) mana)] (Figure 2). The endangered Hawaiian Hawk or Io (Buteo solitarius) is found throughout much of this area and the endangered Ou (Psittirostra psittacea) is present, although very rare, in the mid-elevation (around 1,300 m) ohia forest of this region (Scott et. al. in press). The endangered Hawaiian hoary bat (Lasiurus cinereus semotus) is also present throughout this area.

The Upper Hakalau forest region is an integral component of the continuous belt of mid-elevation forest from windward Mauna Kea to Leeward Mauna Loa. Much of this continuous belt of forest constitutes the essential habitat identified in the recovery plan prepared for the four

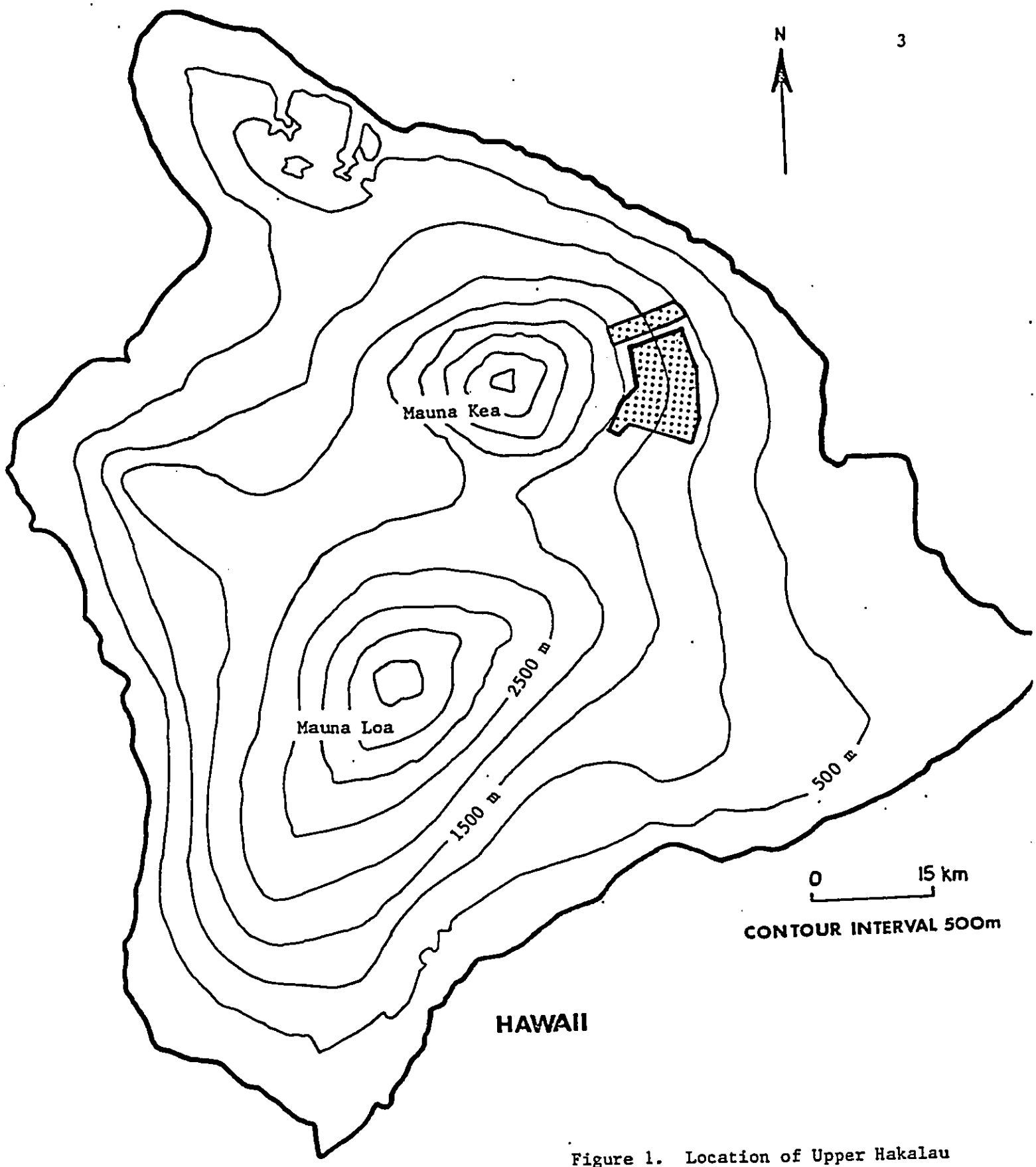
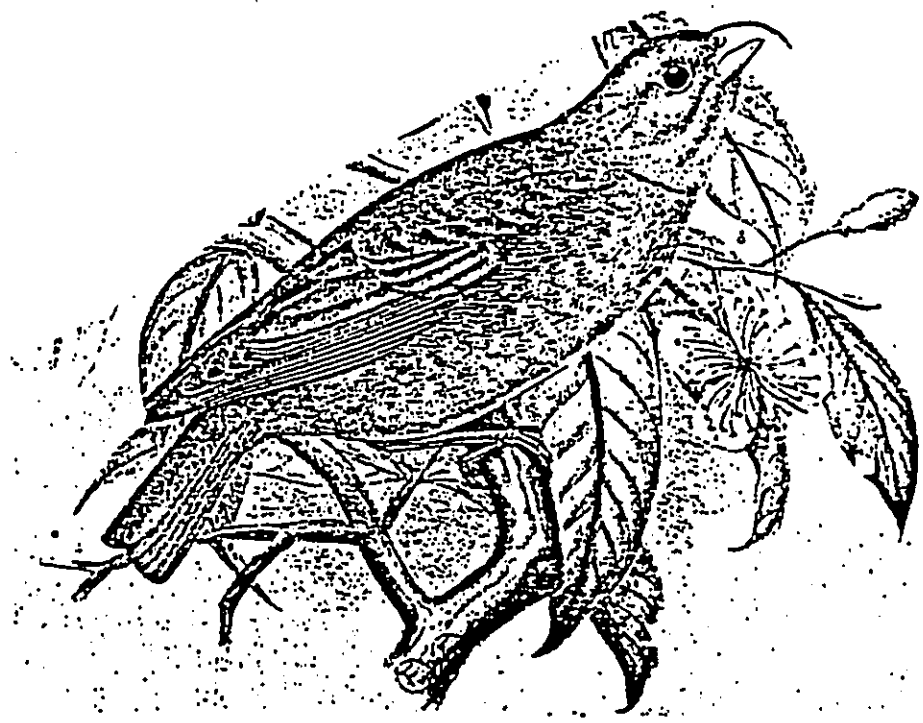


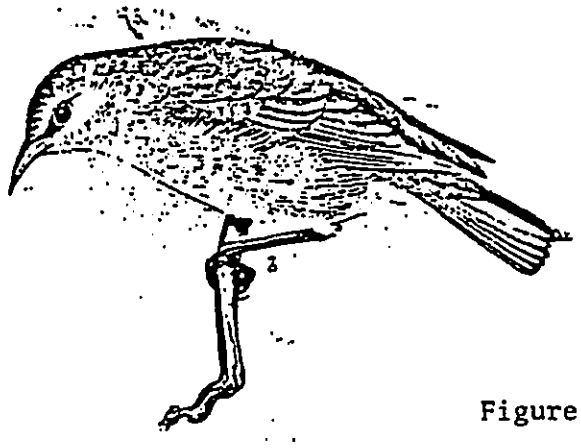
Figure 1. Location of Upper Hakalau Forest Bird Project Site

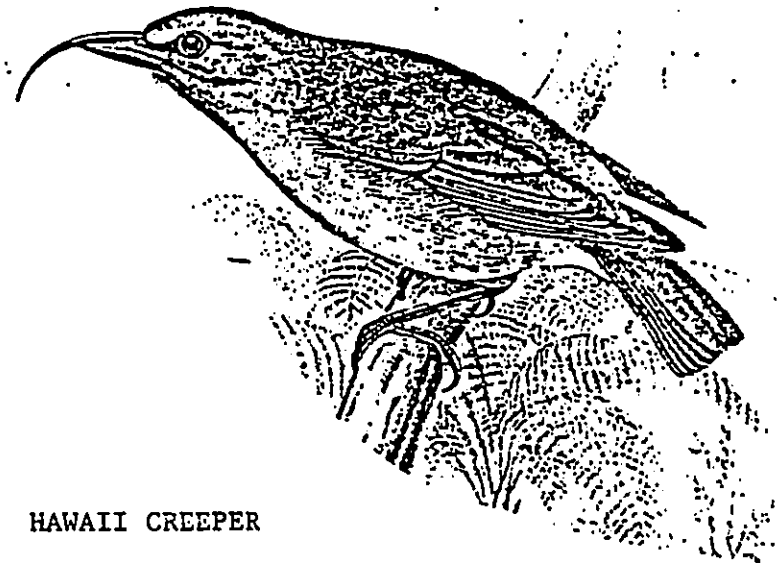
OU

HAWAII AKEPA



AKIAPOLAAU





HAWAII CREEPER

Figure 2 Endangered Hawaii Forest Birds

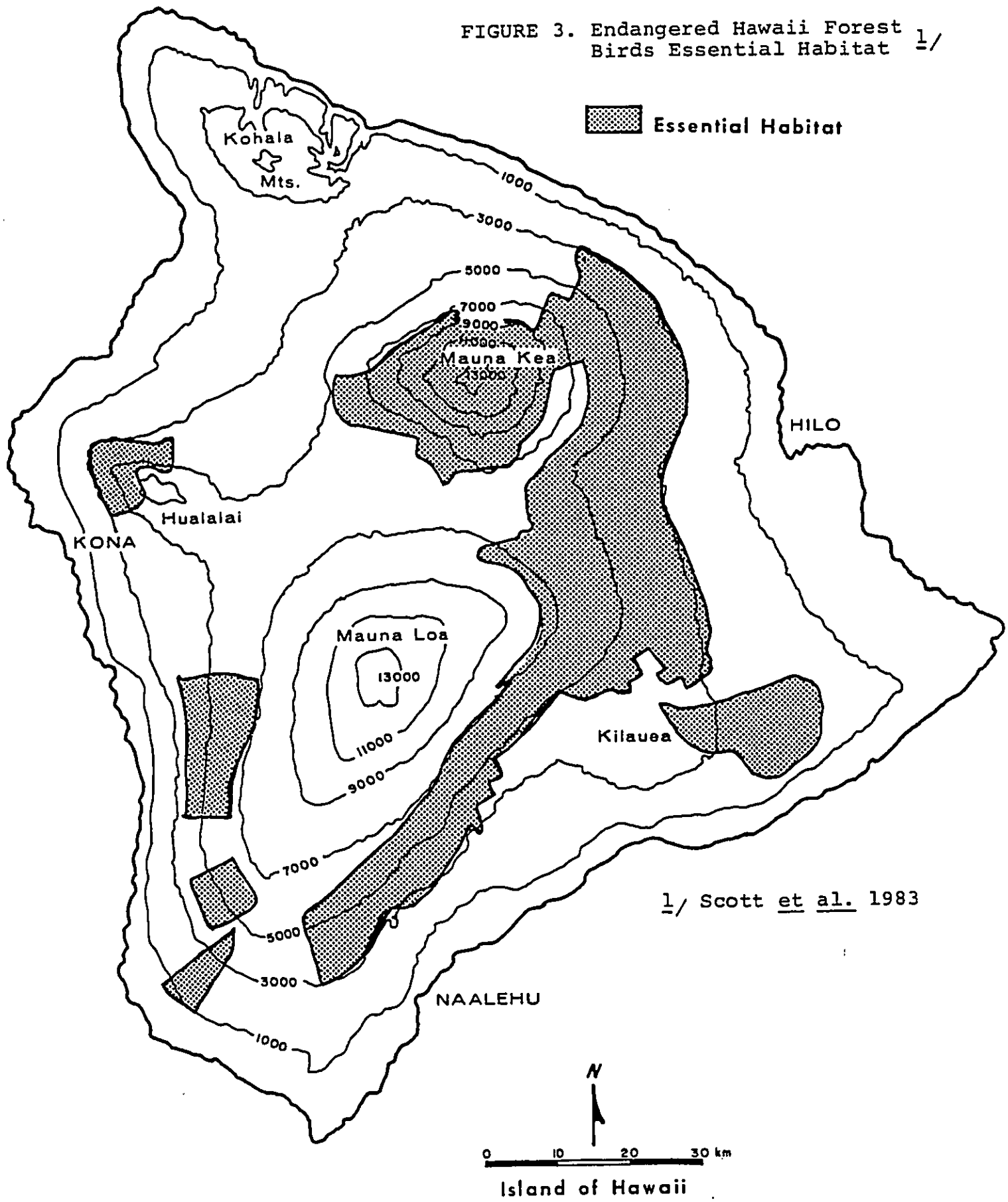
endangered forest birds on the Big Island (Figure 3). Upper Hakalau forest is a core of the current distribution of these endangered forest birds. The purpose of the proposed action is to sustain the naturally evolving mid-elevation rain forest of this area and, as necessary, allow for the management of this forest and its assemblage of native and non-native plant and animals. If accomplished, the Upper Hakalau forest community could function as a hub of the native koa-ohia and ohia forest habitat, allowing for the long-term maintenance of these systems and their component organisms including six endangered species and many more candidate or rare species. This objective can be met by implementing one or a combination of the alternatives presented in this report. The Service's preferred alternative is Alternative B, formation of a National Wildlife Refuge.

Authority for establishing the needed protection is derived from the Endangered Species Act of 1973, (87 Stat. 884) as amended. Funding is available through the Land and Water Conservation Fund Act of 1965 (16 U.S.C. 4601-4 to 4601-11) pursuant to Section 5 of the ESA.

B. Need for Action

The native forested habitats on the Big Island have been subject to many disruptive factors since Hawaii was discovered by people 1500 years ago (Kirch 1983). The rate of changes in the character of the land has increased dramatically in the last 200 years. The wet and dry lowland forests have been almost entirely eliminated by the activities of early Polynesians and by agricultural development and urbanization over the last 100 years. Major portions of mid to upper elevation native forest have been logged and/or cleared for rangeland development or reforested in silviculture projects which primarily utilized introduced tree species.

FIGURE 3. Endangered Hawaii Forest Birds Essential Habitat 1/



1/ Scott et al. 1983

The major changes in native forests on the Big Island have had a corresponding effect on virtually all populations of native forest birds (Scott et al. in press). In conjunction with other major limiting factors (e.g. competition with introduced birds, vulnerability to avian diseases, predation), loss of suitable habitat (or portions of its components such as key food items) has decreased the range and drastically reduced the populations of all native birds. Table 1 summarizes estimated populations and distribution status of all Big Island forest birds from data collected during the Hawaii Forest Bird Survey (Scott et al. in press). Seven of these birds are listed as endangered; of these seven, five are found within the Upper Hakalau region.

The Hawaiian Hawk is actually fairly widespread on the island. It presently occupies an estimated 90% of its historical range. The Upper Hakalau region, however, provides a significant part of the total present-day habitat for Akiapolaau, Hawaii Creeper, Hawaii Akepa and to some extent Ou. An estimated 12% of the extant population of Akiapolaau is found in the upper elevation koa-ohia forests in the Upper Hakalau area. These birds seem to prefer areas with stands of large koa trees in a relatively mesic koa-ohia woodland.

The Hawaii Creeper appears to be most common in the wet dense forests at higher elevations with sufficient numbers of large koa trees. About 22% of the entire extant population of Hawaii Creeper is found in the Upper Hakalau area.

TABLE 1

Status and Distribution of Extant Endemic Big Island Forest Birds[1]

Species	Status	Estimated[2] Total Populations	% of Original Range Still Occupied
Alala	E	76	3
*Ou	E	400	2
*Akiapolaau	E	1,500	5
*Hawaiian Hawk	E	1,600 - 2,500	90 +
Palila	E	2,200	5
*Hawaii Creeper	E	12,500	15
*Hawaii Akepa	E	14,000	10
*Omao		170,000	19
*Elepaio		215,000	36
*Iiwi		311,000	38
*Common Amakihi		870,000	34
*Apapane		1,090,000	39

* = found in the Upper Hakalau area.
E = endangered.

[1] (from Scott et al. In Press)

[2] Based on data collected from 1976-1979.

Almost 35% of the entire extant population of Hawaii Akepa occupy the Upper Hakalau region. They are most abundant in the mesic to wet forests in this area between 1,500 and 2,100 m (Scott et al. in press). The habitat preferences and year-round distribution of Ou are not as well understood but this species has been recorded from the lower reaches of the Upper Hakalau forests. They are found in this area to below 1,300 m where they occupy wet ohia forests (Scott et al. in press).

Although large numbers of endangered forest birds occupy koa-ohia and ohia forests of Upper Hakalau, the habitat is changing. Portions of the upper elevation koa forests are continually subjected to cattle grazing, and maintenance and regeneration of this forest is threatened. Grazing thins out the understory and eliminates koa regeneration. Some of the fine stands of koa found throughout Upper Hakalau area have been partially logged in the past and remaining stands are under increasing pressure for potential logging as other sources of koa dwindle. The pressure of some form of economic use of all these lands continues to affect land uses decisions.

Concurrent with various human land uses which deteriorate native forest conditions is the continuous degradation of some native forests by feral ungulates. Feral cattle (Bos taurus) and pigs (Sus scrofa) continue to cause noticeable changes in native forests through grazing, trampling or rooting activities. Introduced plants such as banana poka (Passiflora mollissima) (on the Piha and Laupahoehoe State forest lands) have become well established in certain forested areas of the Big Island and threaten to overwhelm large tracts of native forests.

II. ALTERNATIVES, INCLUDING THE PROPOSED ACTION

The Upper Hakalau forest bird habitat project area, hereafter referred to as the project, includes or comprises those private land holdings within the boundaries shown in Figure 4. The major landowners of the project site are listed and the tax map keys of the units of land are described in Table 2 and Figure 4.

The following alternatives have been considered as possible means for achieving the objective of maintaining and where necessary, restoring the Upper Hakalau forest system for endangered forest birds and associated components of the koa-ohia and ohia forest of this area.

A. No Action

As the no action term implies, the Fish and Wildlife Service would pursue no activity towards preserving the Upper Hakalau forest. The Service would also not be involved in encouraging others to do anything toward assuring that the Upper Hakalau forest retains those values necessary for the perpetuation of the endangered species using it.

Such an action would be inconsistent with the historical role of the Service and would be contrary to the intent of the Endangered Species Act of 1973.

The following alternatives, having the potential to assure the perpetuation of the habitat within the project area in a manner that would be condusive to the continued existence of the endangered and threatened species now inhabiting the site, have been considered.

B. Create a National Wildlife Refuge Through Fee Title Acquisition

(the preferred alternative)

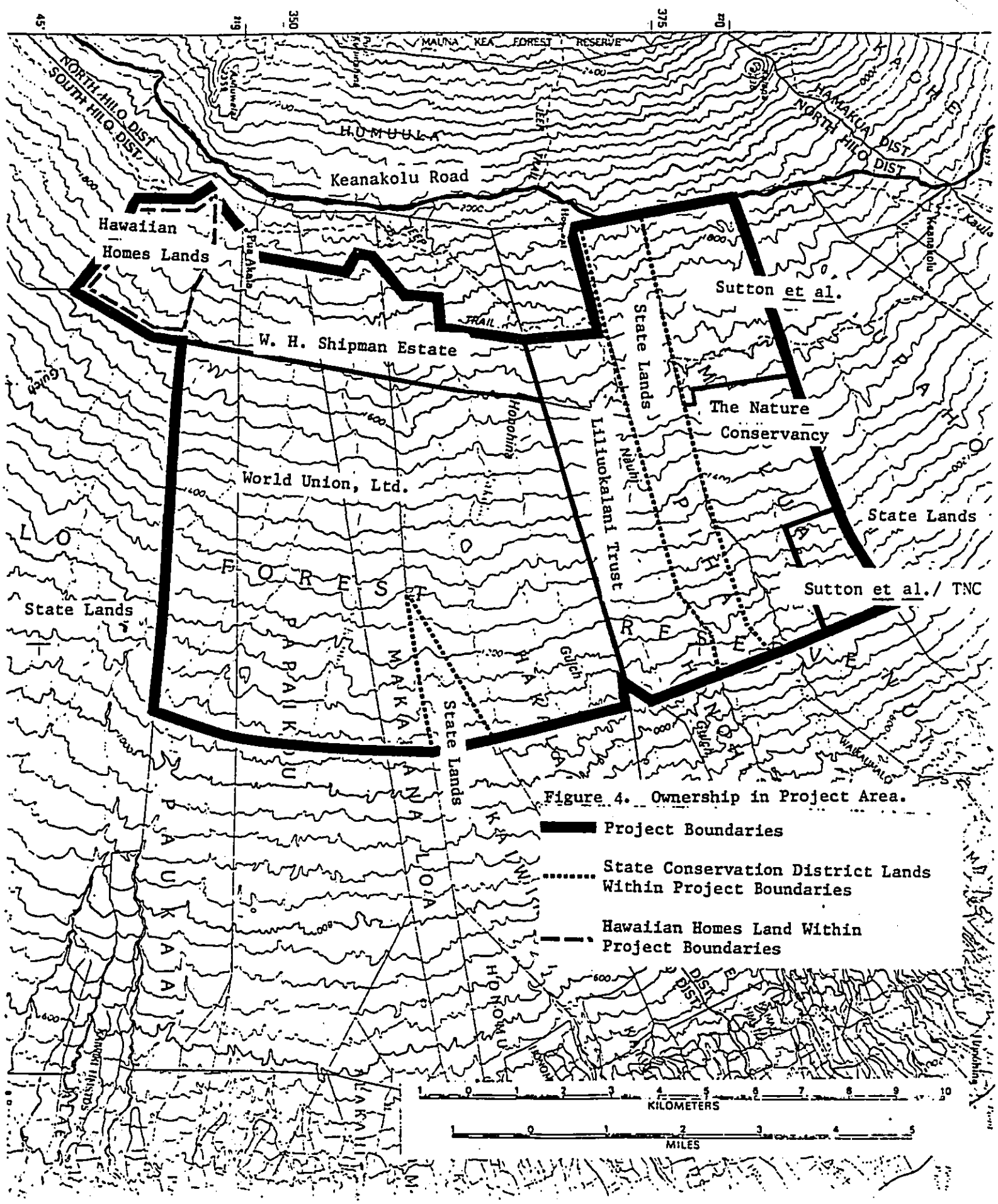


Figure 4. Ownership in Project Area.

Project Boundaries

State Conservation District Lands Within Project Boundaries

Hawaiian Homes Land Within Project Boundaries

TABLE 2

Owner	Tax Map Key Zone	Sec.	Plat	Parcel	Acres (estimated) Inside Project Area	Outside Project Area
World Union Industrial Corp. Ltd.	2	7	01	1	8,050	10,052
	2	8	01	2	2,150	1,600
	2	9	05	2	6,075	2,910
				TOTAL	16,275 (6,589 ha)	14,562 (5,895 ha)
W. H. Shipman Ltd.	2	7	01	4	1,500	308
	2	8	01	1	955	302
	2	9	05	3	1,215.5	1,213.5
				TOTAL	3,670.5 (1,480 ha)	1,823.5 (738 ha)
The Nature Conservancy	3	7	01	1	3,300 (1,336 ha)	
Liliuokalani Trust	3	3	01	3	2,420	1,355
	3	3	01	7	710	1,042
				TOTAL	3,130 (1,267 ha)	2,398 (971 ha)
Richard and Anne Sutton et al.	3	7	01	01	2,628 (1,064 ha)	
TNC/Sutton et al.	3	7	01	01	640 (258 ha)	
			PRIVATE	SUBTOTAL	29,743.5 acres (12,000 ha)	
Hawaiian Homelands	2	6	18	2B	1,437 (582 ha)	
				TOTAL	31,180 (12,622 ha)	

The USFWS would purchase fee title to those privately owned lands within the project area (see figure 4), using Land and Water Conservation Fund monies. These acquired lands would then constitute the Upper Hakalau National Wildlife Refuge to be managed primarily for the benefit of endemic endangered and threatened species in accordance with the various rules and regulations governing the operation and management of the National Wildlife Refuge System. Acquisitions, made on a willing-seller basis, would be based on appraised market value, and owners that qualify would be eligible for benefits available under the Uniform Relocation Assistance and Land Acquisition Policies Act of 1970 (P.L. 91-646).

C. Regulatory or Restrictive Zoning

Regulation of use of most public and private forest lands in Hawaii is governed by State zoning regulations as prescribed by Title 13, Chapter 2, Department of Land and Natural Resources. Any one of five different subzones is assigned to these Conservation District Lands, affording varying degrees of restrictions and resource protection.

The entire Upper Hakalau forest region is presently classified in the "R" subzone. The "R" subzone restricts most land uses but it permits forestry activities which normally result in decline in quality of native forest bird habitat. Variances to the restrictions of all subzones, to allow additional uses such as cattle grazing on "R" subzone lands, can also be obtained through approval of a Conservation District Use Application (CDUA) by the Board of Land and Natural Resources.

The most restrictive zoning within Conservation District Lands, subzone "P", could be imposed on the properties. Occasionally, variances can be obtained even within this subzone, therefore, it would be necessary to insure at the onset that any activities detrimental to the furtherance of endangered species objectives would not be allowed.

The Fish and Wildlife Service has no authority to impose such a zoning ordinance over private property. This authority lies with the Board of Land and Natural Resources of the State of Hawaii.

D. Acquisition/Management by Others

There are organizations other than the Fish and Wildlife Service that could acquire and manage the project area for the protection and conservation of its endangered species and other native wildlife community resources. Potentials include:

1) The Division of Forestry and Wildlife within the Hawaii Department of Land and Natural Resources.

2) Non-governmental conservation organizations such as The Nature Conservancy or the Trust for Public Lands.

3) The National Park Service within the U.S. Department of the Interior.

All have a commitment toward and a deep interest in habitat protection for endangered species. In fact, portions of the Upper Hakalau forest are already owned by the Hawaii Department of Land and Natural Resources and The Nature Conservancy (see Figure 4). However, perhaps due to the magnitude of the effort, none have expressed an interest to undertake the entire project, and most have encouraged FWS involvement because of the endangered wildlife focus of this project.

E. Exchange for Public Land

This would entail the exchange, on an equal-value basis, of private for publicly owned properties within Hawaii. While the exchange of private lands within the Upper Hakalau forest for either federal or state lands is a potential alternative, its feasibility is quite restricted due to the limited acreage (if any) of public lands within the state that would be available and of interest to landowners.

From an administrative perspective, it would be highly impractical to entertain a concept of exchanging private lands on the islands for public lands on the mainland.

F. Acquisition of Partial Interest

A conservation easement or a similar less-than-fee title acquisition, purchased by either a private or governmental entity, could be utilized to protect the Upper Hakalau site. To be effective for the long-term it would be necessary to preclude activities such as timber removal, grazing and other uses that would be detrimental to endangered species utilizing the area. Such rights would probably approach costs similar to fee title purchase and may leave the owners with little more than the right to pay taxes. If purchased by a non-governmental entity, rights to manipulate the habitat for the benefit of endangered species could be negotiated, whereas the expenditure of public funds for management activities (e.g., fencing to contain or exclude wild pigs, or banana poka control) on still private lands may not be feasible.

III. AFFECTED ENVIRONMENT

A. Physical Environment

The Upper Hakalau forest area is located on the Island of Hawaii. This island has been formed over the last 1 million years by tremendous outpourings of lava from five volcanoes; Kohala, Mauna Kea, Hualalai, Mauna Loa, and Kilauea. The Upper Hakalau forest area is situated on the southeast flank of Mauna Kea. This volcanic dome is about 4,177 m high, the highest insular peak on earth (Stearns 1966).

The project area begins at about 1,060 meters elevation and stretches upslope to about 2,200 m. The organic soils are fairly well

developed and continuous. The bedrock is old lava, probably about 4,000 years old. The lower elevation lands contain deep, gentle to steep, and moist to fairly well drained soils with a moderately fine textured subsoil (Sato et al. 1973). The soils on the upper elevation portions of the site are similar but slightly drier and coarser.

The climate is characterized by warm temperatures, with mean high temperatures from 20 to 27 degrees celsius and mean low temperatures from 13 to 18 degrees celsius. Trade wind precipitation predominates, with a mean annual rainfall of up to 700 cm (highest on the island) recorded from the lower elevations. Widespread cloudiness characterizes these windward slopes, particularly during trade wind weather.

B. Biological Environment

The Upper Hakalau area consists of typical mixtures of Hawaiian montane rain forest dominated by ohia and, in some areas, both ohia and koa trees. The ohia rain forest is the most common forest type in this project area. It is generally found in moderately moist to wet situations in the lower and middle elevations (1,100 - 1,500 m). Subcanopy trees and shrubs include kawau (Ilex anomala), kolea (Myrsine lessertiana), kopiko (Psychotria spp.) and olapa (Cheirodendron trigynum). The understory is dominated by tree ferns (primarily Cibotium glaucum). Conspicuous in this wetter forest habitat are several species of Clermontia and many more species of epiphytic ferns.

At the lowest elevation of the project area is the bog - ohia dieback community. This unit is actually a mosaic of open bog, matted fern and native shrub communities, and open to scattered wet ohia forest with many standing dead or partially defoliated trees. The forest

dieback in this area is believed to be a result of the poor rooting conditions found in this extremely wet habitat (Jacobi 1983) but the area is now showing signs of regeneration. The wet open boggy areas are dominated by introduced grass and sedge species with scattered native shrubs.

At the higher elevations, generally between 1,400 and 1,950 m, koa becomes a codominant or dominant tree species in the forest. The structure of a typical koa-ohia rain forest is characterized by tall koa and ohia trees forming a closed tree canopy 15 - 25 m tall, ohia trees forming the mid-story, and tree ferns (Cibotium spp.) and native shrubs forming the understory (Mueller-Dombois 1981). The wet koa-ohia forest extends across the project area in a narrow band between 1,400 and 1,600 m. Sub canopy trees in this particular forest type include those found in the wet ohia forest. Less than 50% of the estimated 35,000 ha of the original distribution of this habitat remains today (Jacobi and Scott in press).

The mesic koa-ohia forest with native shrub dominated understory extends from 1,600 to 1,950 m. Today this particular forest type is fairly restricted in distribution, being found only where cattle grazing has been absent. Subdominant trees include kolea, kawau, and kopiko and the understory is chiefly comprised of native shrubs such as kanawao (Broussaisia arguta), akala (Rubus hawaiiensis), ohelo (Vaccium calycinum) and some ferns. Mesic koa-ohia forest is especially rich in endemic forest birds. This habitat type has also undergone the most significant changes in recent decades. Less than 15% of the estimated 40,000 hectares of the original distribution of this habitat remains today (Jacobi and Scott in press).

The uppermost elevations of the project area have been subjected to cattle grazing for several decades. This has resulted in a slow but steady change in the character of the forest habitats naturally found at these elevations. In areas that have been more heavily grazed, introduced grasses cover much of the ground. Populations, of native shrubs and ferns are reduced. The overstory is largely in good condition, providing valuable habitat for birds. However, little regeneration of woody vegetation survives grazing in these areas.

Fairly large areas, upslope from (outside) the project are dominated by a dry habitat type of introduced grasses with only occasional koa or other native or introduced trees. These areas have been heavily grazed for several decades; whatever woody vegetation naturally occurred in this area has been replaced by open rangeland dominated by exotic grasses.

Figure 5 provides a detailed vegetation map of the project area. Table 3 provides a list of candidate (category 1 or 3C) or uncommon plants from the project area.

The Upper Hakalau forest supports a superb avifauna, rich in species and high in density. Three of the four endangered forest birds of the Big Island -- Akiapolaau, Hawaii Creeper, and Hawaii Akepa are represented with substantial populations (see Table 1). Portions of the koa-ohia forest habitats support up to 50-100 Akiapolaau/km^2 and much larger sections have between 10-50 birds/km^2 (Figure 6). The majority of the project area supports densities of Hawaii Creeper exceeding 100 birds/km^2 and a substantial parcel has densities of over 200/km^2 (Figure 7). The Hawaii Akepa appears to be the most numerous of the endangered birds here. Densities exceed 200/km^2 over a large part of the project site (Figure 8) (Scott et al. in press).

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FIGURE 5

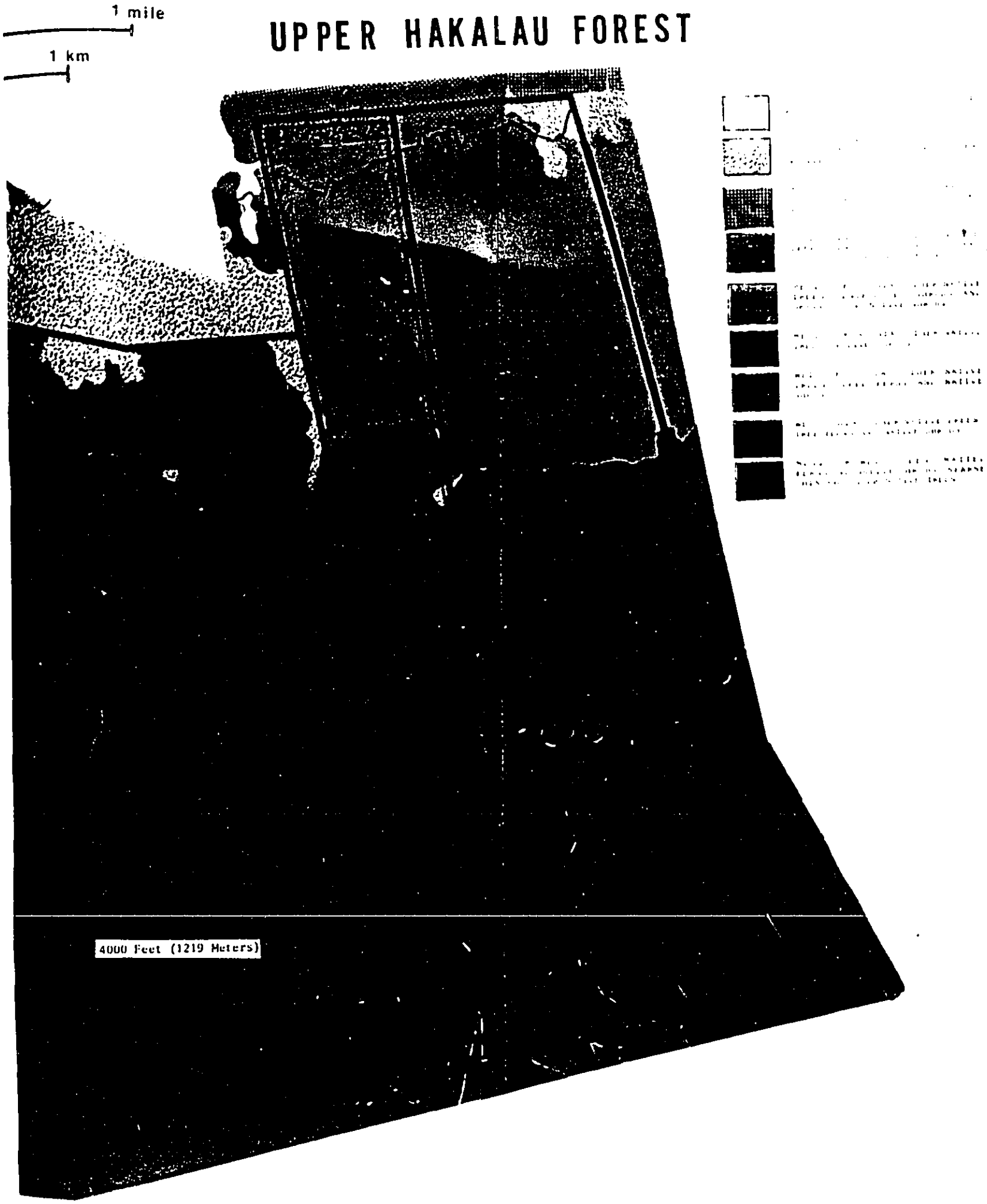


TABLE 3

List of[2] Candidate (Category 1 or 3C)[1] or uncommon (U)[2] plants known from the project area[3]

Species	Status	Vegetation Unit
Clermontia lindseyana	1	mesic and wet koa-ohia forest
Clermontia pyrularia	1	mesic koa-ohia forest
Cyanea fernaldii	1	wet koa-ohia forest
Cyanea shipmanii	1	mesic koa-ohia forest
Gouldia terminalis var. quadrangularis	1	mesic koa-ohia forest
Platydesma remyi	1	wet koa-ohia forest
Clermontia peleana	3C	wet koa-ohia and ohia forest
Joinvillea ascendens	3C	wet koa-ohia and ohia forest, bog/ohia dieback forest
Embelia pacifica	U	mesic & wet koa-ohia forest wet ohia forest
Eurya sandwicensis	U	wet koa-ohia and ohia forest
Phyllostegia racemosa	U	mesic koa-ohia forest
Platydesma spathulata	U	wet koa-ohia and ohia forest
Pritchardia beccariana	U	wet koa-ohia and ohia forest, bog/ohia dieback forest

[1]Candidate species; Category 1 is defined as taxa for which there are adequate data to support listing as threatened or endangered; Category 3C is defined as taxa that are more abundant or widespread than previously thought but could be elevated in consideration if threats increase.

[2]U = Status unknown but thought to possibly be in jeopardy.

[3]USFWS, Mauna Loa Field Station unpubl. data.

Figure 6 AKIAPOLA'AU

Scott et al. in press

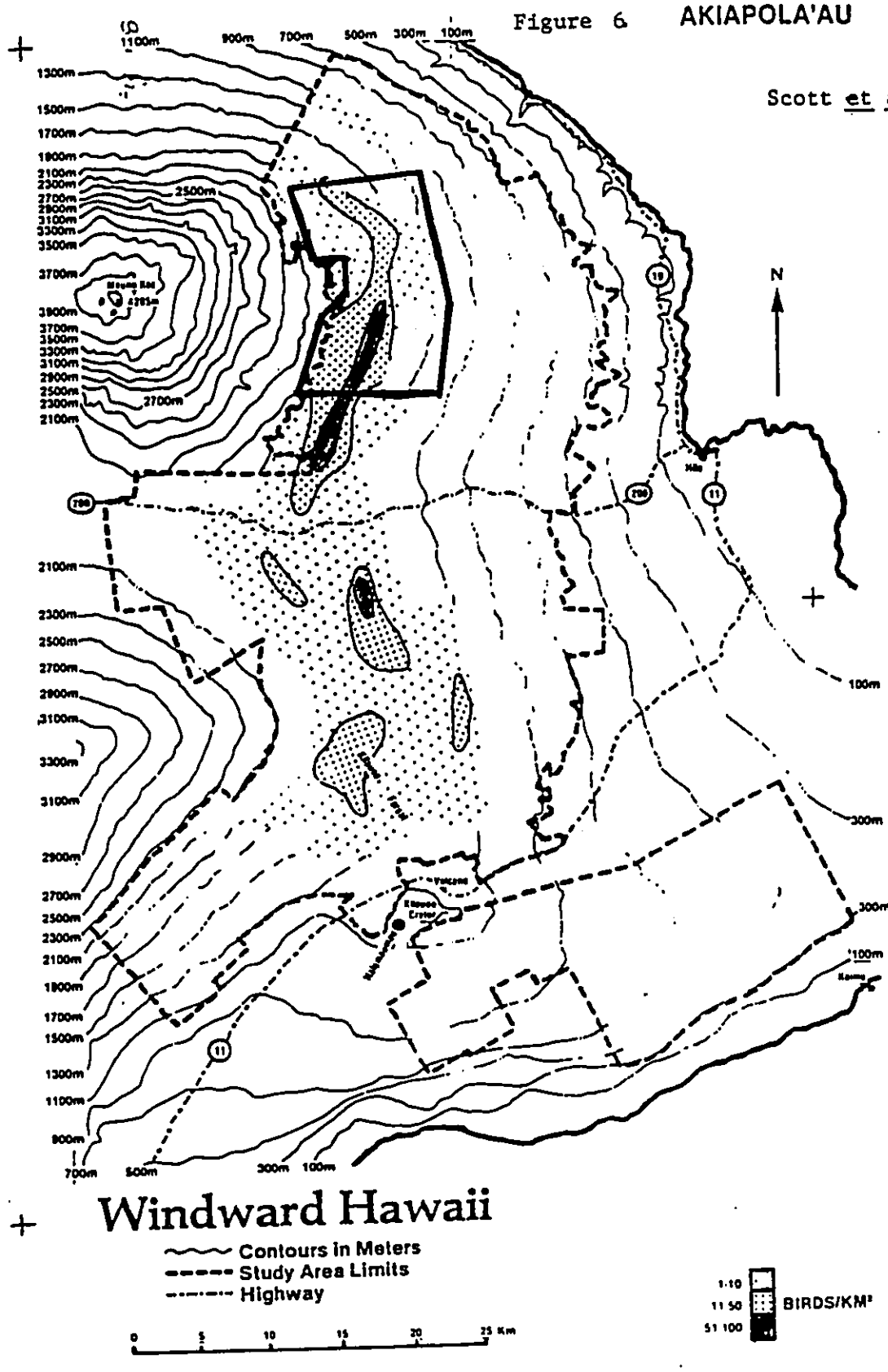


Figure 7. HAWAII CREEPER

Scott et al. in press

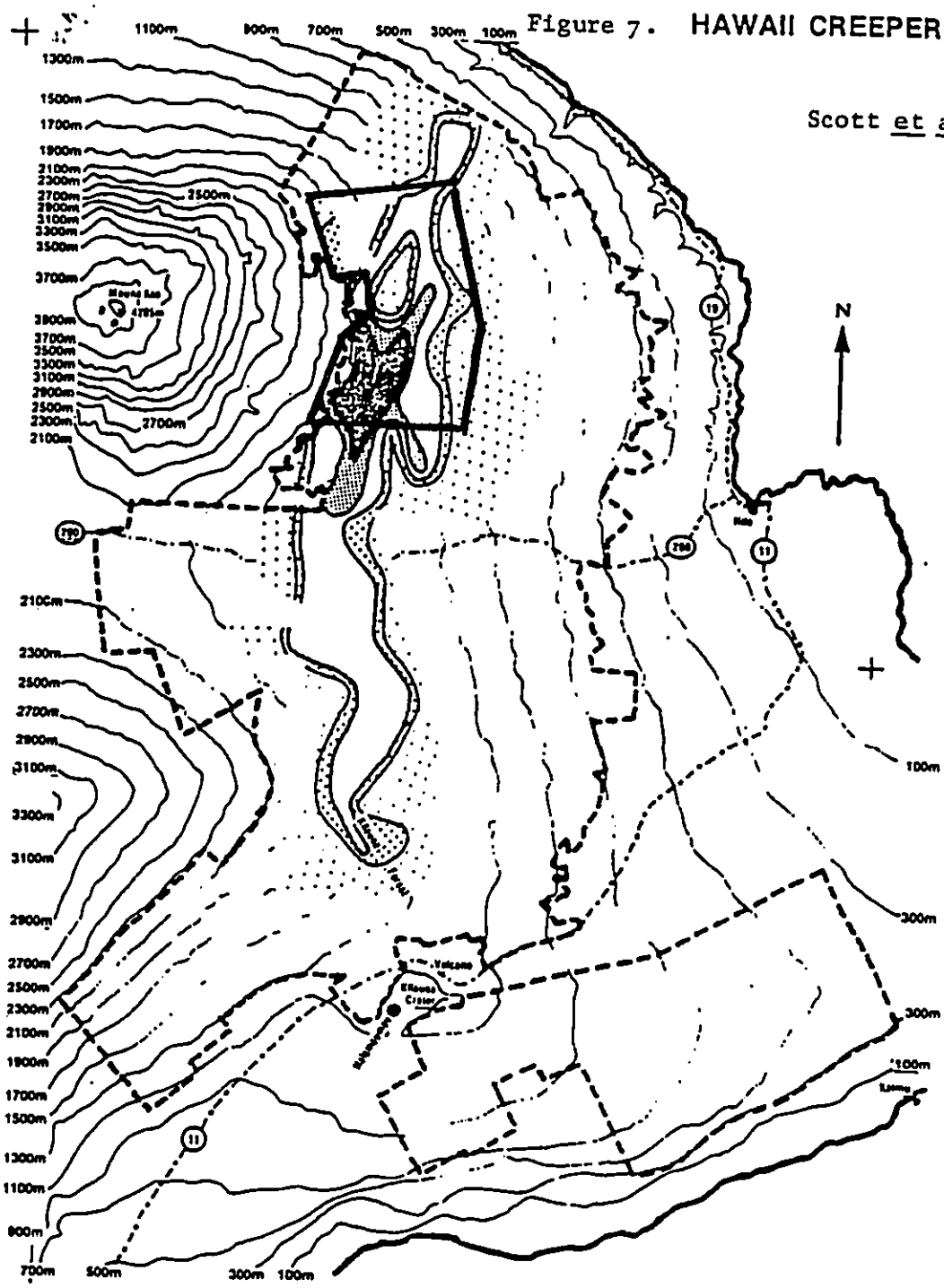
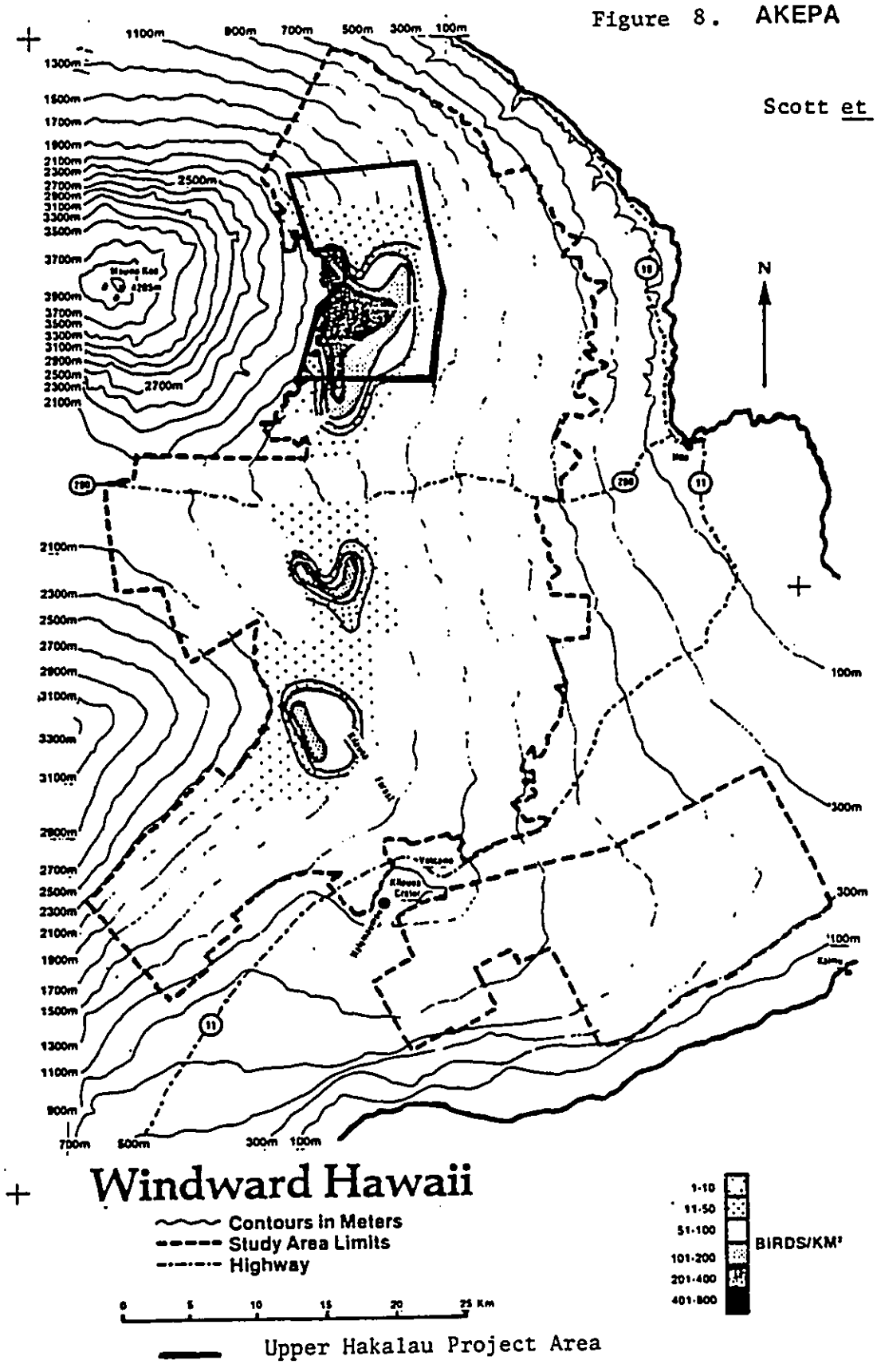


Figure 8. AKEPA

Scott et al. in press



The Ou is found sporadically in the lower elevation ohia forests. Patterns of the distribution of this very rare bird are not clear. Three other endangered birds are also found in or around the area. The Hawaiian Hawk is widespread throughout the Upper Hakalau region, the Nene (Nesochen sandvicensis) nests nearby and has been observed in areas adjoining the project area; and small numbers of the Hawaiian Duck or Koloa (Anas wyvilliana) use streams and other aquatic habitats within and near the project site. Three endemic subspecies are also commonly found in the area. These include the Common Amakihi (Hemignathus virens virens, the Hawaii Thrush or Omao (Phaeornis obscurus obscurus), and the Hawaii Elepaio (Chasiempis sandwichensis sandwichensis).

A number of other native birds and a variety of introduced birds are also common in the project area. The Iiwi (Vestiaria coccinea) has a patchy distribution throughout its historical range (occupying approximately 38% of former range). This species has apparently declined significantly in some areas but there still appear to be robust populations in the Upper Hakalau area. The Apapane (Himatione sanguinea) is the most common native bird on the island and is abundant in the Upper Hakalau area.

Several endemic taxa of birds, formerly found on the Big Island are now extinct. The general vicinity of the project area includes the last known localities for the Hawaii Mamo (Drepanis pacifica) and the Greater Amakihi (Hemignathus sagittrostris) (Berger 1981). Table 4 lists extinct forest bird taxa formerly found on the Big Island.

TABLE 4

Extinct Forest Birds of the Big Island [1]

Species	
Hawaii Oo	Moho nobilis
Kioea	Chaetoptila angustipluma
Lesser koa-Finch	Rhodacanthis flaviceps
Greater koa-Finch	Rhodacanthis palmeri
Grosbeak Finch	Chloridops kona
Hawaii Akialoa	Hemignathus obscurus obscurus
Ula-ai-hawane	Ciridops anna
Hawaii Mamo	Drepanis pacifica

[1] This list does not include undescribed taxa from fossil remains of prehistoric birds.

The only land mammal native to Hawaii is the Hawaiian Hoary Bat. It is found within the project area, but little data exist on distribution and abundance in the project area. A number of introduced mammals are frequently found in the area. Several rodents, [black rats (Rattus rattus), polynesian rats (Rattus exulans), and house mice (Mus musculus)], feral cats (Felis catus), mongoose (Herpestes auropunctatus), feral pigs and some feral cattle and feral dogs (Canis familiaris) all occur within the project area.

The invertebrate fauna of the project area is not well known. However, the Hawaiian invertebrate fauna is widely recognized for its remarkable examples of evolution, speciation and endemism (Zimmerman 1972). A large share of these endemic invertebrates inhabit the koa-ohia rain forest system. Detailed studies of invertebrate faunas in a similar mesic koa-ohia rain forest system about 30 km south of the project site are discussed in Mueller-Dombois et al. (1981).

C. Human Environment

The majority of these lands are presently in a wild, relatively pristine condition. Portions of the forest have been logged in the past and forest products, primarily koa wood, harvested for lumber and cabinet wood. The upper elevations are adjacent to (just downslope from) lands that are presently used as rangeland for grazing cattle. Portions of the project area have also been used for cattle grazing. On the whole, however, relatively little consumptive use has been made of the ohia and koa-ohia forests of the area.

The entire area has historically served as an important watershed for various agricultural and domestic uses. The private and public lands

are classified by the State Department of Land and Natural Resources as Conservation District lands for the purpose of maintaining the watershed capabilities of the land as well as protecting other valuable natural resources.

Almost all of the private lands are in the "R" subzone. This particular subzone designation permits limited use and development, with appropriate management, of the natural resources of the area under sustained use practices. The timber harvesting of the past and potential future commercial logging come under this use category. Biomass production and woodchipping, and other forestry uses that have been contemplated for portions of the project area, also come under this use category. Grazing is also permitted in certain forested areas because it was an established use before that land was designated as conservation lands.

Virtually no notable "improvements" (i.e. structures, etc.) to the land have been made in this area. One unimproved dirt road (Keanakolu Road) leads in towards the project site from State Highway 20 (the Saddle Road). This dirt road travels roughly along the uphill boundary of the project. Several jeep trails lead downslope into the forest to a few cabins or campsites. There are also a few houses and storage buildings in or nearby the upslope end of the project site that support ranching operations. The Dr. David Douglas Historical Monument, a simple memorial at the site where this famous naturalist was killed in 1834, is located just north of the project site near Keanakolu Road.

IV. ENVIRONMENTAL CONSEQUENCES

Presented here are the environmental consequences or impacts expected to result from the various alternative actions described in part II.

A. No Action

Under this alternative, FWS will limit its effort to regulatory actions (Sections 7 and 9 of the ESA) to assure that the Upper Hakalau forest retains the attributes necessary to sustain the endangered species and their habitat found in the area. FWS will not encourage acquisition by any conservation interest. The lands would remain in private ownership.

Under these circumstances, the following conditions would probably develop:

-- Current land use (some logging, some cattle grazing) will persist. Economic pressures will probably require that these uses be intensified and expanded to previously undisturbed habitat.

-- Additional land uses, for example silviculture of non-native trees for biomass production, will be contemplated. Further modification of the land will undoubtedly continue.

-- FWS protection efforts through Section 7 (Inter-agency cooperation and regulations to prevent jeopardizing species) and Section 9 (Prohibition of taking) of the ESA will continue. It is anticipated that these provisions will be inadequate to fully protect habitat.

-- No management effort of significance could be undertaken to maintain native forests. Feral animal and introduced plant populations will persist/increase and cause further decline in the condition of the native forest.

-- Wildland conditions will most likely endure but the nature of the forest would change. Many introduced plants will become established

and some would become dominant species. Significant components of the native rain forest including the understory will eventually be replaced by a non-native assemblage of trees, shrubs, and grasses. The rate of this process is not certain but the end result is.

-- The deterioration of the native forest system will be accompanied by significant declines in native fauna, including birds. Certain species, such as Common Amakihi, Hawaiian Thrush, and Apapane, may maintain themselves in small numbers. Other bird taxa, particularly the endangered ones, will likely decline to extremely low levels and eventually become extirpated from this area.

-- Some number of unlisted taxa of endemic plants and animals will likely decline to levels at which they would become threatened or endangered. Loss of this habitat will mean the loss of an opportunity to protect a significant portion of the koa-ohia ecosystem and much of its component organisms. Additional species will need to be listed as threatened or endangered.

B. <u>Fee Acquisition of Private Lands, Formation of a National Wildlife Refuge</u>.

This alternative will require use of Land and Water Conservation Fund money to purchase, in fee, the private lands of the Upper Hakalau area. The lands will then become a National Wildlife Refuge, administered and managed by the FWS. Habitat protection for the portion of the proposed refuge now under the control of the Hawaiian Homes Commission (see Figure 4) may be accomplished by any one of several options, including fee acquisition. The anticipated effects of this action include the following:

-- Approximately 12,622 hectares of koa-ohia and ohia rain forest would be protected in perpetuity. With State owned lands (predominantly "P" subzone Forest Reserve or Natural Area Reserve) on the north and south flanks of this project area, virtually the entire band of montane rain forest from Keanakolu to the Kilauea Forest will be under near maximum legal protection.

-- No significantly adverse modification of native forest habitat due to direct human use will occur. Land uses that cause detrimental changes in the quality of the native forest, such as timber harvest and cattle ranching, will no longer continue.

-- Management of this refuge will minimize present and future effects of feral animals and introduced plants. Efforts will focus on perpetuating the natural functions of the ecosystem.

-- Most or all endemic plant and animal populations in this forest will be maintained indefinitely. Several endangered species will be significantly closer to recovery goals. Other rare taxa will probably sustain themselves at levels which do not require listing attention.

-- Opportunities for educational, recreational and scientific pursuits in this area will be enhanced. Educational opportunities could include interpretive displays and self-guided tours, use by schools, etc. Wildlife oriented recreational possibilities include birdwatching, hiking, outdoor experiences for a variety of organizations, etc. A number of opportunities would exist for field research in a variety of biological/ecological disciplines.

-- Public hunting of game mammals and birds may be included as part of a comprehensive management program for the project. This activity could be part of the overall management program to reduce feral animal populations to a level which does not significantly damage the ecosystem. It may be necessary to exclude feral ungulates from some areas to protect especially sensitive habitat. Public hunting could be used as one management tool, as long as it is consistent with the primary purposes of the refuge.

-- Federal (FWS, NPS) and State (DLNR) land management agencies could work cooperatively on management of a contiguous band of montane rain forest. This rain forest, extending from windward Mauna Kea to leeward Mauna Loa, with the exception of a few areas, would be a continuous band of public lands. Vital watershed values will be maintained as well as a variety of other public uses.

-- The impact on the local economy is not entirely clear. Existing land uses in the project area would cease, having an effect on a ranching operation and potential logging possibilities. Future economic use of the land will be extremely limited (except for watershed and flood control values). The tax base will decrease also.

However other economic benefits would occur. Hawaii County will receive monies from the Refuge Revenue Sharing Act (49 Stat. 383, as amended 16 U.S.C. 715s) which provides annual compensation in lieu of discontinued taxation of private

property[1]. Based on the formulae described below, this could result in significant payments to Hawaii County. A limited amount of full time and intermittent employment opportunites will also result from the establishment and subsequent management of this refuge.

The attraction of this refuge will also probably have a positive effect on the visitor industry. The FWS 1980 National Survey of Fishing, Hunting and Wildlife-Associated Recreation states that about 28.8 million adults (17% of the American population) took trips primarily to observe or photograph wildlife (USFWS 1982). This provides some indication that there might be visitor interest in a National Wildlife Refuge of this magnitude on the Big Island.

[1]Refuge Revenue Sharing Act payments are made to counties on the basis of one of the following, whichever is highest:

1. Twenty-five percent of the net revenue received from operation of the refuge.
2. Three-fourths of one percent of the cost of the property. Property costs are adjusted every five years to reflect current market values.
3. Seventy-five cents per acre. The funding source for such payments derives from revenues generated from refuges throughout the country. In the event that insufficient revenues are available to make full-formula payments to the counties, the amount of payment is a determined percentage of the full amount calculated. Also, Congress may make up the insufficiency by special appropriation, if it chooses to do so.

C. Regulatory or Restrictive Zoning

Under this alternative, legal protection could be sought through designation and maintenance of maximum restrictive zoning for the project area. Under maximum restrictive zoning conditions, land use will be highly restricted and will remain compatible with habitat maintenance objectives for forest birds. Virtually no land uses which alter the habitat would be permitted.

Ownership would remain private. There is little likelihood that sufficient incentive will be available for the landowners to perform necessary management of introduced animals and plants. Habitat conditions will remain relatively stable; however, the effects of introduced species will continue. In certain areas the effects may further deteriorate habitat conditions.

D. Acquisition/Management by Others

Under this alternative, acquisition and management would be assumed by another organization with interest in the conservation of endangered species and other native wildland resources. If another organization would be able to acquire the project area and establish a management program, the effects on the biological and human environment are anticipated to be very similar to establishment of a National Wildlife Refuge (Alternative B). The koa-ohia rain forest ecosystem would be maintained intact for the perpetuation of endangered species and other native wildland resources.

E. Exchange for Public Land

An exchange of the private lands of the project area for acceptable public lands would result in impacts similar to either alternative B or D. If federal lands were involved and/or the federal government would be

responsible for subsequent management, the impacts discussed in Alternative B would result. If another organization provided the lands for exchange and assumed responsibility for management, the impacts in Alternative D (similar to Alternative B except a different organization is involved) would result.

F. Acquisition of Partial Interest

Acquisition of simply a conservation easement or a similar less-than-fee title acquisition, would result in establishment of refuge and management program very similar to Alternative B. However, long-term commitments of resources for management purposes may be more limited than under Alternative B. Rights for management of the area may also have some limitation depending on the conditions of the easement (or other such agreement).

The lands would probably be maintained in a condition similar to that resulting under Alternative B for the duration of the easement term.

V. CONSULTATION AND COORDINATION

Consultation/coordination activities have been pursued as follows:

A. Policy and Legal Compliance

1. Executive Orders -- Compliance by the FWS with Executive Order 11988 (Floodplain Management) and 11990 (Protection of Wetlands) will be adhered to since the FWS plans to make no significant changes relative to floodplain or wetlands on the Upper Hakalau forest lands once they are in refuge status.

2. Executive Order 12372 (Intergovernmental Review of Federal Programs) -- Copies of this Environmental Assessment will be sent to the Hawaii State Clearinghouse and concerned federal entities.

3. Archaeological and Historic Property Acts -- Following establishment of the refuge, the National Historic Preservation Act of 1966, as amended and refuge policy will assure protection to sites of significant importance.

4. Endangered Species Act -- Six endangered species occur in the Upper Hakalau area. Relative to the Endangered species Act of 1973, an internal Section 7 Consultation has been initiated.

B. Agencies and Organizations Contacted.

Initial reference to the importance of the Upper Hakalau forest area for endangered forest birds was made in the Hawaii Forest Birds Recovery Plan. Many government agencies and other organizations were contacted during the review process of this plan. Protection of the Upper Hakalau area was one of many tasks identified in the plan.

Upon completion and analysis of the Hawaii Forest Bird Survey data, protection of this area became a prime priority. Habitat protection proposals and budget initiatives were started.

Various interested and/or affected parties have been contacted over the last few months. These include:

W. H. Shipman Estate

Queen Liliuokalani Children's Trust

The Nature Conservancy

Department of Hawaiian Homelands

State Department of Land and Natural Resources

County of Hawaii

National Park Service

U.S. Forest Service

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CORRECTION

THE PRECEDING DOCUMENT(S) HAS
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